

### ***In the Claims***

The listing of claims presented below will replace all prior versions, and listings, of claims in the Application:

1. (Currently Amended) A method of calibrating a quantum key distribution (QKD) ~~QKD~~ system having a first QKD station (Bob) with a first modulator (MB) ~~[[,]]~~ and a second QKD station (Alice) with a second modulator (MA), comprising:

a) operating the QKD system with a first modulator basis voltage value  $V_B(1)$  for the first modulator and varying ~~the~~ a basis voltage  $V_A$  ~~of~~ for the second modulator to establish a first basis voltage value  $V_A(1)$  for the second modulator that yields constructive interference of detected quantum pulses;

b) operating the QKD system with the first modulator basis voltage value  $V_B(1)$  for the first modulator while varying the basis voltage  $V_A$  ~~of~~ for the second modulator to establish a second basis voltage value  $V_A(2)$  for the second modulator that yields destructive interference of detected quantum pulses;

c) operating the QKD system with a second modulator basis voltage value  $V_B(2)$  for the first modulator and varying the basis voltage  $V_A$  ~~of~~ for the second modulator to establish a third basis voltage value  $V_A(3)$  for the second modulator that yields constructive interference of detected quantum pulses; and

d) operating the QKD system with the second modulator basis voltage value  $V_B(2)$  for the first modulator while varying the basis voltage  $V_A$  ~~for~~ of the second modulator to establish a fourth basis voltage value  $V_A(4)$  for the second modulator that yields destructive interference of detected quantum pulses.

2. (Currently Amended) The method of claim 1, including:

e) operating the QKD system with basis voltages for the first and second modulators that would be expected to yield a 50:50 photon count probability between each of two single-photon detectors;

f) measuring the ~~photons~~ photon count probability using the single-photon detectors; and

g) if the measured photon count probability in f) is not 50:50, varying at least one of the basis ~~voltages~~ voltage values  $V_B(1)$  and  $V_B(2)$  for the first modulator and

repeating acts a) through f) until the photon counts probability becomes 50:50.

3. (Original) A method according to claim 1, including:

during operation of the QKD system, measuring photon counts in respective first and second single-photon detectors to establish the basis voltages  $V_A(1)$ ,  $V_A(2)$ ,  $V_A(3)$  and  $V_A(4)$  that yield a minimum photon count in either of the first and second detectors.

4. (Currently Amended) A method of calibrating a quantum key distribution (QKD) ~~QKD~~ system having first and second operably coupled QKD stations Bob and Alice with respective first and second modulators MB and MA driven by respective basis voltages  $V_B$  and  $V_A$ , comprising:

a) exchanging photons between the QKD stations while fixing basis voltage  $V_B$  to a first value  $V_B(1)$  and varying the ~~second~~ basis voltage  $V_A$  to determine basis ~~voltages~~ voltage values  $V_A(1)$  and  $V_A(2)$  that correspond to  $[[a]]$  either a minimum or maximum photon count; and

b) exchanging photons between the QKD stations while fixing the ~~first~~ basis voltage  $V_B$  to a second value  $V_B(2)$  and varying the ~~second~~ basis voltage  $V_A$  to determine basis ~~voltages~~ voltage values  $V_A(3)$  and  $V_A(4)$  that correspond to  $[[a]]$  either a minimum or maximum photon count ; ~~and~~

~~— c) operating the QKD system with intentionally selected incorrect basis voltages  $V_B$  and  $V_A$  and measuring a probability distribution of detecting constructive versus destructive interference between photons modulated by modulators MA and MB to ensure orthogonality of the basis voltages .~~

5. (Currently Amended) The method of claim  $[[4]]$  13, ~~wherein adjusting the basis voltages in act c) includes~~ including repeating acts a) through c) with one or more different ~~first~~ basis voltage values for voltage  $V_B$  if the measured probability distribution is different than 50:50, so as to establish values for basis voltages  $V_A$  and  $V_B$  that yield the 50:50 probability distribution.

6. (Currently Amended) The method of claim 4, including operating the QKD system with the ~~calibrated~~ basis voltage values  $V_B(1)$ ,  $V_B(2)$ ,  $V_A(1)$ ,  $V_A(2)$ ,  $V_A(3)$  and  $V_A(4)$ .
7. (Currently Amended) The method of claim ~~[[4]]~~ 13, including programming a controller operably coupled to i) modulator drivers ~~(44, 14)~~ that are operably coupled to ~~respective~~ modulators MB and MA, respectively, and ii) to first and second single-photon detectors, to carry out acts a) through ~~[[d)]]~~ c).
8. (Currently Amended) A method of calibrating ~~two~~ first and second modulators MA and MB in a quantum key distribution (QKD) ~~QKD~~-system, comprising:
  - a) operating the QKD system with a first fixed modulation voltage  ~~$V_B(1)$~~ for value  $V_B(1)$  for the first modulator MB and varying a modulation voltage  $V_A$  of ~~for~~ the second modulator to establish first and second basis ~~voltages~~ voltage values  $V_A(1)$  and  $V_A(2)$  for the second modulator ~~based on~~ by measuring photon counts ~~in one or more single-photon detectors~~; and
  - b) operating the QKD system with a second fixed modulation voltage  ~~$V_B(2)$~~ for value  $V_B(2)$  for the first modulator MB and varying ~~[[a]]~~ the modulation voltage  $V_A$  of the second modulator to establish third and fourth basis ~~voltages~~ voltage values  $V_A(3)$  and  $V_A(4)$  for the second modulator based on measuring photon counts ~~in the one or more single-photon detectors~~.
9. (Currently Amended) The method of claim 8, including:
 

measuring the an orthogonality of the ~~modulation~~ basis voltage values ~~voltages~~  $V_B(1)$ ,  $V_B(2)$ ,  $V_A(1)$ ,  $V_A(2)$ ,  $V_A(3)$  and  $V_A(4)$ .
10. (Currently Amended) The method of claim 9, including adjusting at least one of the basis voltages so that the basis voltage values ~~voltages~~ are orthogonal if the measurement of claim 9 reveals that the ~~modulation~~ basis voltage values ~~voltages~~ are not orthogonal.
11. (Currently Amended) The method of claim ~~[[8]]~~ 9, including wherein measuring

an the orthogonality of the ~~modulation~~ basis voltage values ~~voltages~~ by includes:

c) setting the basis ~~modulation~~ voltages to values expected to yield a 50:50 photon count probability distribution between constructively and destructively interfered photons;

d) measuring the photon count probability distribution; and

e) if the photon count probability distribution is other than 50:50, adjusting at least one of the basis voltages for the first modulator ~~MB~~ and repeating acts a) through d) to achieve a 50:50 photon count probability distribution.

12. (Currently Amended) The method of claim 8, including operating the QKD system with the ~~calibrated~~ basis voltage values  $V_B(1)$ ,  $V_B(2)$ ,  $V_A(1)$ ,  $V_A(2)$ ,  $V_A(3)$  and  $V_A(4)$  as calibrated basis voltages.

13. (New) The method of claim 4, including:

c) operating the QKD system with basis voltage values other than  $V_B(1)$ ,  $V_B(2)$ ,  $V_A(1)$ ,  $V_A(2)$ ,  $V_A(3)$  and  $V_A(4)$ , and measuring a probability distribution of detecting constructive versus destructive interference between photons modulated by modulators MA and MB to assess orthogonality of the basis voltage values  $V_B(1)$ ,  $V_B(2)$ ,  $V_A(1)$ ,  $V_A(2)$ ,  $V_A(3)$  and  $V_A(4)$ .